IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Michael S. Beck, et al.	Group Art Unit:	3616
Serial No.:	10/784,739	Examiner:	Eric D. Culbreth
Filing Date:	February 23, 2004	Atty Docket No.:	2063.007600
Title:	System And Method For Actively Controlling Traction In An Articulated Vehicle	Client Ref:	VS-00620
		Confirmation No.:	2452

CORRECTED APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby submit this Corrected Appeal Brief to the Board of Patent Appeals and Interferences in response to the Notice of Non-Compliant Appeal Brief dated August 28, 2008.

The fee for filing this Appeal Brief is $510 has already been paid, however, the Commissioner is authorized to deduct or credit any fees from or to Williams, Morgan & Amerson Deposit Account No. 50-0786 (2063.007600).

I. REAL PARTY IN INTEREST

Lockheed Martin Corporation, the assignee hereof, is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences of which Applicants, Applicants' legal representative, or the Assignee are aware that will directly affect or be directly affected by or have a bearing on the decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-23 and 44-63 are pending in the case. Claims 1-23 were originally filed in the case, claims 24-43 were previously cancelled, and claims 44-63 were previously added. Claims 24-43 were canceled responsive to a restriction requirement. The Office rejected each of claims 1-23 and 44-63 as follows:

- claims 1-5, 7-11, 13-15, 17-22, 44-48, 50-54, 56-58, and 60-63 were rejected as obvious under 35 U.S.C. §103(a) over United States Letters Patent 5,517,414 ("Hrovat") in view of United States Letters Patent 4,895,257 ("Brandstadter");
- claims 6, 12, 16, 49, 55, and 59 were rejected as obvious under 35 U.S.C. §103(a) over Hrovat in view of Brandstadter and United States Letters Patent 6,481,801 ("Krueger"); and
- claim 23 was rejected as obvious under 35 U.S.C. §103(a) over Hrovat in view of Brandstadter and United States Letters Patent 5,762,407 ("Stacey et al.").

Applicants appeal from each and every rejection of each and every claim. For the convenience of the Office, Applicants expressly identifies the claims involved in this appeal as claims 1-23 and 44-63.

IV. STATUS OF AMENDMENTS

A paper was filed after the "final" Office Action on April 11, 2008, but it contained no amendment. An Advisory Action issued on April 22, 2008.

A subsequent paper was filed on May 9, 2008, and it did contain amendments to the claims. The "original" Appeal Brief was filed May 12, 2008, noting that the May 9th paper amending the claims had recently been filed but that the Office had not had an opportunity to consider it. An advisory action issued on May 19, 2008, stating that the amendments in the May 9th paper would be entered. However, the Office issued the Notice of Non-Compliant Brief because the already filed Appeal Brief did not reflect those amendments. The Claims Appendix to this Corrected Appeal Brief reflects those amendments.

V. SUMMARY OF CLAIMED SUBJECT MATTER

This invention relates to a vehicle traction control system and, in particular, to a traction control system for vehicle having an articulated suspension and a method of controlling the traction of the vehicle. ¶[0003] **FIG. 1A - FIG. 1C**, reproduced below, illustrate one particular embodiment of a vehicle 100 according to the present invention. ¶[0057] The vehicle 100 comprises a plurality of wheel assemblies 102 articulated with a chassis 104. ¶[0057] In the illustrated embodiment, each of the plurality of wheel assemblies 102 is rotationally articulated with the chassis 104, as indicated by arrows 103. ¶[0057] In the embodiment illustrated in **FIG. 1A - FIG. 1C**, the wheel assemblies 102, when attached to the chassis 104, implement an articulated suspension system for the vehicle 100. ¶[0058]

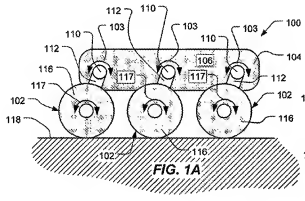


FIG. 1A

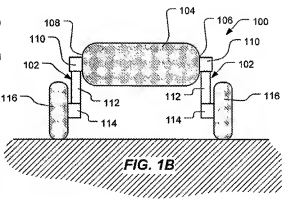


FIG. 1B

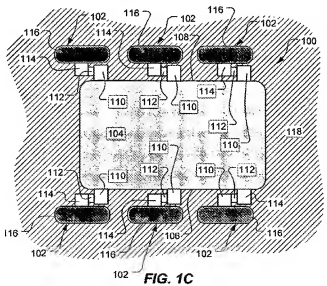
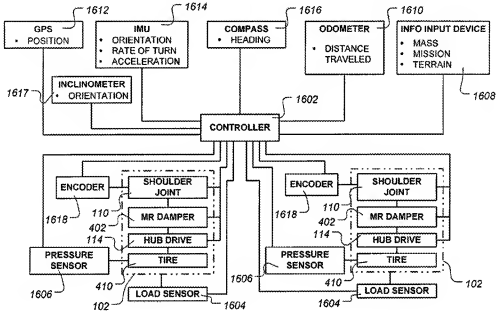


FIG. 1C

FIG. 16, reproduced below, provides one illustrative embodiment of a system 1600 for controlling traction in an articulated vehicle, (*e.g.*, the vehicle 100 in **FIG. 1A – FIG. 1C**. ¶[0134] In this embodiment, a controller 1602 is electronically coupled with various elements of the vehicle 100 such that data may be transmitted therebetween. ¶[0134] Note that, while the vehicle 100 may include any chosen number of wheel assemblies 102, **FIG. 16** depicts only two wheel assemblies 102 for clarity and so as not to obscure the invention. ¶[0134]



For example, in this embodiment, a controller 1602 is electrically coupled with each of the shoulder joints 110, rotary MR dampers 402, and hub drives 114 for monitoring and controlling the actions of these elements. ¶[0134] A load sensor 1604 provides the amount of loading on each of the wheel assemblies 102 to the controller 1602 and a pressure sensor 1606 for each of the tires 410 provides pressure information to the controller 1602. ¶[0135] An odometer 1610 provides distance-traveled data to the controller 1602 from which it calculates the velocity and acceleration of the vehicle based on that data. ¶[0136] The system also includes one or more of a GPS receive 1612, an IMU 1614, a compass 1616, and an inclinometer 1617 for data such as position, orientation, rate of turn, acceleration, and heading. ¶[0137] Based on data provided by these sensors, the controller 1602 effects control over the traction of the vehicle 100 according to the methods described above. ¶[0136]

The illustrated embodiment includes a plurality of encoders 1618 corresponding to the plurality of wheel assemblies 102. ¶[0138] The embodiment illustrated employs an arm position

encoder 420 and a torsion bar twist encoder 422 to acquire data regarding the position of the arm 304 and the twist on the torsion bar assembly 310, respectively. ¶[0138] From this data, the controller 1602 can determine the arm speed, arm reaction torque, and estimated suspension load for the shoulder joint 210. ¶[0138] From this information, the controller 1602 has knowledge of the articulated location of each of the wheel assemblies 102 with respect to the chassis 104. ¶[0138]

It is often desirable to control the vehicle's traction with respect to the terrain so that a stable, proper course and speed may be held while traversing a path or to extricate the vehicle from a traction limiting situation. ¶[0115] Thus, according to the embodiment of the present invention illustrated in **FIG. 11**, reproduced herein, a performance characteristic of the vehicle 100 is determined (block 1102) and stored (block 1104). ¶[0115] A performance characteristic of at least one of the wheel assemblies 102 is determined (block 1106) and stored (block 1108). ¶[0115] In some embodiments, however, the performance characteristics are not stored but, rather, are determined and used. ¶[0115] The vehicle 100's performance characteristic and the at least one wheel assembly 102's performance characteristic are compared (block 1110). ¶[0115] The performance of the vehicle 100 is altered based upon the comparison (in block 1110) to affect the vehicle 100's traction (block 1112). ¶[0115]

As the vehicle 100 travels, it is likely to encounter various types of terrain. ¶[0117] For example, the terrain may be relatively homogeneous and soft, such as loose gravel or sand, or may be relatively homogeneous and hard, such as a paved surface. ¶[0117] Alternatively, the terrain may be heterogeneous, such that it comprises both hard and soft materials. ¶[0117] Further, for example, heterogeneous terrain may include firmly fixed rocks with loose sand, gravel, mud, or rocks disposed therebetween. ¶[0117] Various embodiments of the method for controlling traction presented above may be used to address different terrain scenarios. ¶[0117] Several of these exemplary scenarios are discussed further in ¶[0118]-¶[0133].

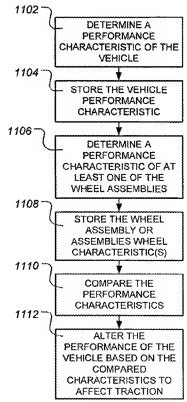


FIG. 11

Turning now to the language of the claims, **claims 1, 4, 10, 14, 44, 47, 53, and 57 are independent**. With respect to **claim 1**,

a method of controlling traction in a vehicle suspension, the invention comprises:

- determining (*e.g.*, at 1102 in **FIG. 11**; ¶[0115]-¶[0117]) a performance characteristic (*e.g.*, ¶[0116]) of a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]);
- determining (*e.g.*, at 1106 in **FIG. 11**; ¶[0115]-¶[0117]) a performance characteristic (*e.g.*, ¶[0116]) of at least one of a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]) of a rotatably articulating suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]) of the vehicle, the suspension capable of rotatably articulating in a plane defined by the pitch of the vehicle;
- comparing (*e.g.*, at 1110 in **FIG. 11**; ¶[0115]-¶[0117]) the performance characteristic of the vehicle and the performance characteristic of the at least one of the plurality of wheel assemblies; and
- altering (*e.g.*, at 1112 in **FIG. 11**; ¶[0115]-¶[0133]) the performance of the vehicle based upon the comparison to affect the vehicle's traction.

With respect to **claim 4**, a method of controlling traction in a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]) having a rotatably articulating suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]), the invention comprises:

- determining (*e.g.*, at 1202 in **FIG. 12**; ¶[0118]; ¶[0117]-¶[0133]) a load on each of a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]) of the articulated suspension; and
- adjusting (*e.g.*, at 1206 in **FIG. 12**; ¶[0118]; ¶[0117]-¶[0133]) the suspension through rotation in a plane defined by the pitch of the wheeled vehicle such that each of the loads is within a predetermined range.

With respect to **claim 10**, a method of controlling traction in a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]) having a rotatably articulating suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]), the invention comprises:

- acquiring (*e.g.*, at 1302 in **FIG. 13**; ¶[0121]-¶[0122]; ¶[0118]-¶[0120]) load data for a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]) of the articulated suspension;

- identifying (*e.g.*, at 1310 in **FIG. 13**; ¶[0121]-¶[0122]; ¶[0118]-¶[0120]) a lightly loaded wheel assembly of the plurality of wheel assemblies from the load data; and
- rotatably articulating (*e.g.*, at 1314 in **FIG. 13**; ¶[0121]-¶[0122]; ¶[0118]-¶[0120]) the lightly loaded wheel assembly with respect to a chassis (*e.g.*, 104 in **FIG.1A - FIG. 1C**; ¶[0069]) of the vehicle in a plane defined by the pitch of the wheeled vehicle.

With respect to **claim 14**, a method of controlling traction in a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]) having rotatably articulating suspension, the invention comprises:

- determining (*e.g.*, ¶[0118]-¶[0120]) whether forces on each of a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]) of the articulated suspension are substantially equal;
- determining (*e.g.*, at 1402 – 1412 in **FIG. 14**; ¶[0127]-¶[0128]) whether a rotational velocity of each wheel of the plurality of wheel assemblies corresponds to a velocity of the wheeled vehicle; and
- rotatably (*e.g.*, ¶[0118]-¶[0120]; *see* at 1414 – 1416 in **FIG. 14**; ¶[0127]-¶[0128]) articulating the suspension in a plane defined by the pitch of the wheeled vehicle such that each of the forces is within a predetermined range if the forces are not substantially equal and at least one of the rotational velocities fails to correspond to the velocity of the wheeled vehicle.

With respect to **claim 44**, a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]), the invention comprises:

- a chassis (*e.g.*, 104 in **FIG.1A - FIG. 1C**; ¶[0069]);
- a suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]) rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]);
- means (*e.g.*, 1608, 1610, 1612, 1614, 1616, or 1617 and 1602 in **FIG. 16**; ¶[0136]-¶[0137]), for determining a performance characteristic (*e.g.*, ¶[0116]) of the wheeled vehicle;

- means (*e.g.*, 1604, 1606, or 1618, and 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a performance characteristic (*e.g.*, ¶[0116]) of at least one of the wheel assemblies;
- means (*e.g.*, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for comparing the performance characteristic of the wheeled vehicle and the performance characteristic of the at least one of the plurality of wheel assemblies; and
- means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for altering the performance of the vehicle based upon the comparison to affect the wheeled vehicle's traction.

With respect to **claim 47**, a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]), the invention comprises:

- a chassis (*e.g.*, 104 in **FIG.1A - FIG. 1C**; ¶[0069]);
- a suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]) rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]);
- means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a load on each of the wheel assemblies; and
- [means for][1] (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) adjusting the suspension through rotation such that each of the loads is within a predetermined range.

With respect to **claim 53**, a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]), the invention comprises:

- a chassis (*e.g.*, 104 in **FIG.1A - FIG. 1C**; ¶[0069]);
- a suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]) rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]);
- means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for acquiring load data for the wheel assemblies;

[1] This is a clerical error and the limitation should be "*means for* adjusting…" and can easily be corrected on remand. Applicant has also attempted to amend this claim to eliminate this error by paper filed May 9, 2008.

- means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for identifying a lightly loaded wheel assembly of the plurality of wheel assemblies from the load data; and
- means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for rotatably articulating the lightly loaded wheel assembly with respect to the chassis.

With respect to **claim 57**, a wheeled vehicle (*e.g.*, 100 in **FIG. 1A - FIG. 1C**, **FIG. 4**; ¶[0057]-¶[0067]), the invention comprises:

- a chassis (*e.g.*, 104 in **FIG.1A - FIG. 1C**; ¶[0069]);
- a suspension (*e.g.*, 102, 112 in **FIG. 1A - FIG. 1C**; ¶[0058]) rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]), each wheel assembly including a wheel;
- means (*e.g.*, 1604, 1606, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining whether forces on each of a plurality of wheel assemblies (*e.g.*, 102 in **FIG. 1A - FIG. 1C**; ¶[0059]-¶[0060]) of the articulated suspension are substantially equal;
- means (*e.g.*, 114, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining whether a rotational velocity of each wheel corresponds to a velocity of the wheeled vehicle; and
- means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for rotatably articulating the articulated suspension such that each of the forces is within a predetermined range if the forces are not substantially equal and at least one of the rotational velocities fails to correspond to the velocity of the wheeled vehicle.

In addition, some of the dependent claims include "means-plus-function" language:

- claim 45 recites means (*e.g.*, 114, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a velocity of the vehicle;
- claim 45 recites [means for][2] (*e.g.*, 114, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) determining a rotational velocity of the at least one of the plurality of wheel assemblies;

[2] This is a clerical error and the limitation should be "*means for* determining..." and can easily be corrected on remand. Applicant has also attempted to amend this claim to eliminate this error by paper filed May 9, 2008.

- claim 46 recites means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a load on a first of a plurality of wheel assemblies;
- claim 46 recites means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a load on another one or more of the plurality of wheel assemblies;
- claim 48 recites means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a load on each suspension arm of the plurality of wheel assemblies;
- claim 49 recites means (*e.g.*, 1606, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a pressure of each tire of the plurality of wheel assemblies;
- claim 50 recites means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for adjusting the articulated suspension to substantially equalize the loads;
- claim 51 recites means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle;
- claim 52 recites means (*e.g.*, 1602, 1604 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that the adjusting means articulates the lightly loaded wheel assembly with respect to a chassis of the vehicle;
- claim 54 recites means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a load on each suspension arm of the plurality of wheel assemblies;
- claim 55 recites means (*e.g.*, 1602, 1606 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a pressure of each tire of the plurality of wheel assemblies;
- claim 56 recites means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for articulating the lightly loaded wheel assembly to substantially equalize the load on each of the plurality of wheel assemblies;
- claim 58 recites means (*e.g.*, 1604, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a load on each suspension arm of the plurality of wheel assemblies;
- claim 59 recites means (*e.g.*, 1602, 1606 in **FIG. 16**; ¶[0136]-¶[0137]) for sensing a pressure of each tire of the plurality of wheel assemblies;

- claim 60 recites [means for][3] (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) adjusting the articulated suspension to substantially equalize the forces;
- claim 61 recites means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle;
- claim 62 recites means (*e.g.*, 1602, 110 in **FIG. 16**; ¶[0136]-¶[0137]) for determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that adjusting the articulated suspension comprises articulating the lightly loaded wheel assembly with respect to a chassis of the vehicle; and
- claim 63 recites means (*e.g.*, 114, 1602 in **FIG. 16**; ¶[0136]-¶[0137]) for reducing the rotational velocity of one of the tires if the forces are substantially equal and the one of the tires has a determined rotational velocity that is greater than that which corresponds to the velocity of the vehicle.

Note that the references in parentheses are not limitations in the claims but relate the claim language to Applicants' disclosure in compliance with the Rules of Practice.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1-5, 7-11, 13-15, 17-22, 44-48, 50-54, 56-58, and 60-63 are obvious under 35 U.S.C. §103(a) over United States Letters Patent 5,517,414 ("Hrovat") in view of United States Letters Patent 4,898,257 ("Brandstadter").

B. Whether claims 6, 12, 16, 49, 55, and 59 are obvious under 35 U.S.C. §103(a) over Hrovat in view of Brandstadter and United States Letters Patent 6,481,801 ("Krueger").

C. Whether claim 23 is obvious under 35 U.S.C. §103(a) over Hrovat in view of Brandstadter and United States Letters Patent 5,762,407 ("Stacey et al.").

[3] This is a clerical error and the limitation should be "*means for* adjusting…" and can easily be corrected on remand. Applicant has also attempted to amend this claim to eliminate this error by paper filed May 9, 2008.

VII. ARGUMENT

Each of the rejections relies in whole or in part on the combination of United States Letters Patent 5,517,414 ("Hrovat") and United States Letters Patent 4,898,257 ("Brandstadter"). As is established below, Brandstadter teaches away from Hrovat, and so each of the rejections fails on that ground. However, the Rules of Practice promulgated by the Office require that each ground of rejection be treated separately. Accordingly, each of the grounds for rejection will now be addressed in turn.

A. CLAIMS 1-5, 7-11, 13-15, 17-22, 44-48, 50-54, 56-58, & 60-63 ARE UNOBVIOUS OVER HROVAT & BRANDSTADTER

The Office rejected claims 1-5, 7-11, 13-15, 17-22, 44-48, 50-54, 56-58, and 60-63 as obvious under 35 U.S.C. §103(a) over United States Letters Patent 5,517,414 ("Hrovat") in view of United States Letters Patent 4,898,257 ("Brandstadter"). Each of the rejections relies on the combination of Hrovat and Brandstadter, which cannot be properly combined.

1. Applicant's Position

More particularly, Hrovat teaches an active suspension system (Hrovat, Abstract) that is, presumably, for on-road vehicles and whose operation Brandstadter categorizes as for on-road vehicles (Brandstadter, (col. 2, lines 6-24). Brandstadter teaches a suspension system for an off-road vehicle. In the course of doing so, it teaches away from generally using on-road active suspension systems in off-road vehicles:

> *In a road vehicle, the dynamic component is primarily due to the acceleration, braking, and cornering inertial forces acting on the vehicle.* These forces are smaller than the static force, and the aforedescribed parallel arrangement results in a substantial reduction in the energy required to stabilize the vehicle in reaction to these forces.
>
> *In an off-road vehicle, however, the dynamic component is primarily due to terrain disturbances producing large road wheel motions.* The forces associated with these large motions are greater than the static force and the parallel arrangement results in an increase in the energy required to isolate the vehicle in reaction to these motions. *Thus, the increased size, weight, and cost of the*

> *parallel arrangement is not offset by a comparable reduction in the energy requirements under off-road conditions and,* ***therefore, this type of system is not applicable to off-road vehicles generally and to combat vehicles specifically.***

(col. 2, lines 6-24; emphasis added) Thus, according to Brandstadter, on-road and off-road suspension systems encounter forces differently, and sufficiently differently that on-road suspension systems generally do not yield sufficient performance for off-road vehicles.

Brandstadter therefore specifically teaches away from using on-road active suspension systems in off-road vehicles such as is taught by Hrovat. There can be no motivation or suggestion to combine references as a matter of law where one of the references teaches away from the claimed invention. *In re Fine*, 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Gordon*, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984); M.P.E.P. §2145 X D 2. Thus, under law and under Office policy, Hrovat and Brandstadter are not combinable.

Furthermore, it is by now well established that teaching away by the prior art constitutes *prima facie* evidence that the claimed invention is not obvious. *See, inter alia, In re Fine,* 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Nielson*, 2 U.S.P.Q.2d (BNA) 1525, 1528 (Fed. Cir. 1987); *In re Hedges*, 228 U.S.P.Q. (BNA) 685, 687 (Fed. Cir. 1986). The Office at one time justified the combination of Hrovat and Brandstadter as follows:

> It would have been obvious to one of ordinary skill and creativity in the art at the time the apparatus was made to modify the suspension of Hrovat to rotatably articulate in a plane defined by the pitch of the vehicle as taught by Brandstadter so as to accommodate use of the system on off-road vehicles that commonly use suspensions that articulate in the plane defined by the pitch of the vehicle (background).

(Office Action dated August 15, 2006, Detailed Action, p. 8, ¶3) It therefore appears that the Office essentially believes that Applicant has but taken an on-road active suspension system and put it in an off-road vehicle. If this is, indeed, the Office's position, then Brandstadter establishes that Applicant's invention is *prima facie* non-obvious.

Thus, on its face, Brandstadter refutes the proposition that it can be properly combined with Hrovat. Each of the rejections relies upon the combination of Hrovat and Brandstatder, and so each of the rejections fails since they are not properly combinable. And, if the Office's position is what it seems, then Applicant's invention as claimed is *prima facie* unobvious over the art of record.

2. The Office's First Attempt at Rebuttal

The Office subsequently agreed with this Applicants' construction of Brandstadter in the "final" Office Action. It nevertheless argued that Applicant took that passage out of context:

> Applicant argues Brandstadter teaches away from using on-road active suspension systems off-road, citing Brandstadter col 3, line 5-25 [*sic*]. *While Examiner agrees, the citation has been taken out of context; this text is referring to the shortcoming of prior art US4639013.*

("Final" Office Action dated March 15, 2007, emphasis added)

Applicant respectfully disagrees. The Office apparently believes the context includes the whole discussion of active suspension systems, which would include the paragraph preceding that which Applicant quoted. It is true the preceding paragraph cites U.S. Letters Patent 4,639,013, but it cites it as an exemplar of the types of systems under discussion:

> The *active suspension systems* sense various operating conditions and control both the damping and the spring forces in accordance with the sensed conditions. The *resultant performance* ***of such systems*** requires input of considerable energy to drive pump components therein. *U.S. Pat. No. 4,639,013 describes an active suspension apparatus* ***of this type*** which attempts to reduce input energy requirements while improving ride. In the '013 patent, a single acting hydraulic actuator and an associated variable, offset, hydropneumatic chamber control the static component of the force acting on the vehicle and a parallel, double acting, hydraulic actuator and an associated servovalve and damping valve control the dynamic component of the force acting on the vehicle.

(col. 1, line 58-col. 2, line 4, emphasis added)

The language "of such systems" clearly indicates a discussion of active suspension systems generally. The phrase "of this type" in the passage "*U.S. Pat. No. 4,639,013 describes an active suspension apparatus* ***of this type***" clearly indicates that the reference is being used as an example of the type of active suspension systems generally under discussion. Thus, contrary to the Office's assertion, the citation of U.S. Letters Patent 4,639,013 does not limit the teaching to foreclose Applicants construction.

Even in the larger context, the passage of Brandstadter therefore teaches the broader proposition for which Applicant cites it. And Brandstadter therefore teaches away from Hrovat. Accordingly, there can be no motivation or suggestion to combine references as a matter of law where one of the references teaches away from the claimed invention. *In re Fine*, 5 U.S.P.Q.2d

(BNA) 1596, 1599 (Fed. Cir. 1988); *In re Gordon*, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984); M.P.E.P. §2145 X D 2. Thus, under law and under Office policy, Hrovat and Brandstadter are not combinable.

The rest of the Office's position in rebuttal was unsupported and internally contradictory. The Office began by stating:

> Examiner further notes that it is within the ability of one of ordinary skill in the art, and even the ordinary skill of the vehicle driver, to understand the conditions for which a particular suspension arrangement is suitable.

("Final" Office Action dated March 15, 2007) There is no evidence of record to support this proposition. Applicant disputed this assertion and requested that the Examiner properly support it by placing an affidavit or declaration of personal knowledge in the record or providing other documentary evidence as required by M.P.E.P. §2144.03 C. However, no such declaration was produced. The Office therefore has not properly established this assertion.

The Office then began an extensive discussion of how, despite varying conditions, on-road and off-road suspension systems really are quite the same.

> Although the components themselves [of off-road systems] may be adapted differently for particular conditions and applications, the mechanics of the system are often the same, as they are in this case.

("Final" Office Action dated March 15, 2007) The statement that "the mechanics of the system are often the same" necessarily implies the opposite fact, as well—namely, that they often are not. This logic is sweeping aside the very salient fact that in some ways they can be very different. Thus, on-road and off-road are not necessarily as closely related as the Office would like to believe. Notably, this assertion is also unsupported by evidence. Applicant also challenged this assertion, and support must be made of record pursuant to M.P.E.P. §2144.03 C.

The lack of proper support for all of this "reasoning" is all the more critical given the fact that Brandstadter teaches away from the very kind of combination that the Office is attempting to justify. This is even true under the Office's construction in which Brandstadter is not teaching away from active, on-road suspension systems generally but to that of U.S. Letters Patent 4,639,013. Even under this construction, Brandstadter is directly contradicting the Office's position that on-road and off-road suspension systems are sufficiently similar to be asserted in this manner. Essentially, Brandstadter refutes the Office's "parts is parts" approach to applying

the cited art and the Office's position to the contrary is completely devoid of *evidence*. The evidence of record, therefore, refutes the Office's position.

3. The Office's Last Attempt at Rebuttal

In the Advisory Action, the Office changed its position somewhat, stating:

> Applicant's argument seems to center on Brandstadter teaching away from using an on road system on an off road vehicle, focusing on col. 2, lines 6-24. This is not persuasive because the reference in fact states that combat vehicles (definitely off road vehicles) at the time of that invention use passive suspension systems (column 1, lines 15-20), that active systems are used for road vehicles (column 1, lines 38-41) that the forces encountered by an off road vehicle are different than an on road vehicle (col. 2, lines 6-24, noted by applicant), and that the very object of Brandstadter's invention is to use an active system on an offroad [*sic*] vehicle (column 3, lines 26-35), i.e., to adapt an on road vehicle concept to an off road system.

(Advisory Action, ¶11) Note, however, the Brandstadter does *not* say that it is incorporating an on-road active suspension system into an off-road vehicle. Thus, even though the facts recited by the Office are correct, the conclusion it draws does not necessarily follow—nothing in the three facts cited by the Office refutes Applicant's position.

Applicants do not contend that active suspension systems can find no place in off-road vehicles. Indeed, not only does Brandstadter disclose such a system, it discusses and criticizes another reference disclosing an active suspension system for a combat vehicle. (*see* col. 2, lines 25-41) Nowhere does Brandstadter state that it is attempting to incorporate an on-road active suspension system into its off-road vehicle. Indeed, a closer review of Brandstadter upholds Applicant's position because Brandstadter discloses a new kind of active suspension system that differs from active on-road suspension systems. This teaching, in fact, invalidates a part of the Office's reasoning quoted above.

Brandstadter's criticism of on-road active suspension systems in an off-road context is, at least in part, a function of energy requirements not found in on-road vehicles:

> In an off-road vehicle, however, the dynamic component is primarily due to terrain disturbances producing large road wheel motions. The forces associated with these large motions are greater than the static force and the parallel arrangement results in an

> increase in the energy required to isolate the vehicle in reaction to these motions. *Thus, the increased size, weight, and cost of the parallel arrangement* ***is not offset by a comparable reduction in the energy requirements under off-road conditions*** *and, therefore, this type of system is not applicable to off-road vehicles generally and to combat vehicles specifically.*

(col. 2, lines 6-24; emphasis added) And, as noted by the Office, Brandstadter is disclosing an active suspension system. However, the very passage cited by the Office establishes that this new active suspension system is in fact different from on-road active suspension systems:

> Another feature of the present invention is to provide an active hydropneumatic suspension system for off-road vehicles, wherein a sprung mass is supported relative to a movable unsprung mass ***and wherein the system's energy requirements are reduced***, and in particular, wherein the sprung mass is the hull of a heavy combat vehicles, supported by such *an active hydropneumatic system* ***whose energy requirement is substantially less than the energy absorbed by the dampers of known passive suspension systems***.

(col. 3, lines 26-35, emphasis added) That is, Brandstadter is attempting to develop an active system with reduced energy requirements—which will remedy that which is exactly what is wrong with on-road active suspension systems.

4. Conclusion

Thus, Hrovat teaches an on-road suspension system. Brandstadter, on the other hand, teaches that on-road active suspension systems are not suitable for use in an off-road vehicle. The two references therefore cannot be combined. Furthermore, if the Office's position is what it seems, then Applicant's invention as claimed is *prima facie* unobvious over the art of record. Wherefore, Applicant requests that the rejections be REVERSED.

B. CLAIMS 6, 12, 16, 49, 55, & 59 ARE UNOBVIOUS OVER HROVAT BRANDSTADTER & KRUEGER

The Office rejected claims 6, 12, 16, 49, 55, and 59 as obvious under 35 U.S.C. §103(a) over United States Letters Patent 5,517,414 ("Hrovat") in view of United States Letters Patent 4,898,257 ("Brandstadter") and United States Letters Patent 6,481,801 ("Krueger"). This

rejection, like the previous one, predicated on the combination of Hrovat and Brandstadter, and it therefore suffers from the same defects. Those defects are that (1) Brandstadter teaches away from Hrovat and therefore the two cannot be combined, and (2) Brandstadter teaches away from application of Hrovat to the present invention. Applicants therefore incorporate by reference their arguments from Section VII A above in support of its appeal from this ground of rejection.

C. CLAIM 23 IS UNOBVIOUS OVER HROVAT, BRANDSTADTER & STACEY ET AL.

The Office rejected claim 23 as obvious under 35 U.S.C. §103(a) over United States Letters Patent 5,517,414 ("Hrovat") in view of United States Letters Patent 4,898,257 ("Brandstadter") and United States Letters Patent 5,762,407 ("Stacey et al."). This rejection, like the previous one, predicated on the combination of Hrovat and Brandstadter, and it therefore suffers from the same defects. Those defects are that (1) Brandstadter teaches away from Hrovat and therefore the two cannot be combined, and (2) Brandstadter teaches away from application of Hrovat to the present invention. Applicants therefore incorporate by reference their arguments from Section VII A above in support of its appeal from this ground of rejection.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal – claims 1-31 and 54-61 – are set forth in the attached "Claims Appendix."

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATING PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

Applicant respectfully submits that the application is in condition for allowance. Accordingly, Applicant requests that the rejections be overturned and that the application be allowed to issue.

The Examiner is invited to contact the undersigned attorneyat (713) 934-4053 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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CLAIMS APPENDIX

1. A method of controlling traction in a vehicle suspension, comprising:

determining a performance characteristic of a wheeled vehicle;

determining a performance characteristic of at least one of a plurality of wheel assemblies of a rotatably articulating suspension of the vehicle, the suspension capable of rotatably articulating in a plane defined by the pitch of the vehicle;

comparing the performance characteristic of the vehicle and the performance characteristic of the at least one of the plurality of wheel assemblies; and

altering the performance of the vehicle based upon the comparison to affect the vehicle's traction.

2. A method, according to claim 1, wherein:

determining the performance characteristic of the vehicle comprises determining a velocity of the vehicle; and

determining the performance characteristic of the at least one of the plurality of wheel assemblies comprises determining a rotational velocity of the at least one of the plurality of wheel assemblies.

3. A method, according to claim 1, wherein:

determining the performance characteristic of the vehicle comprises a load on a first of a plurality of wheel assemblies; and

determining the performance characteristic of the at least one of the plurality of wheel assemblies comprises a load on another one or more of the plurality of wheel assemblies.

4. A method of controlling traction in a wheeled vehicle having a rotatably articulating suspension, comprising:

determining a load on each of a plurality of wheel assemblies of the articulated suspension; and

adjusting the suspension through rotation in a plane defined by the pitch of the wheeled vehicle such that each of the loads is within a predetermined range.

5. A method, according to claim 4, wherein determining the load comprises sensing a load on each suspension arm of the plurality of wheel assemblies.

6. A method, according to claim 4, wherein determining the load comprises sensing a pressure of each tire of the plurality of wheel assemblies.

7. A method, according to claim 4, wherein adjusting the articulated suspension comprises adjusting the articulated suspension to substantially equalize the loads.

8. A method, according to claim 4, wherein adjusting the articulated suspension comprises articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle.

9. A method, according to claim 4, further comprising determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that adjusting the articulated suspension comprises articulating the lightly loaded wheel assembly with respect to a chassis of the vehicle.

10. A method of controlling traction in a wheeled vehicle having a rotatably articulating suspension, comprising:

acquiring load data for a plurality of wheel assemblies of the articulated suspension;

identifying a lightly loaded wheel assembly of the plurality of wheel assemblies from the load data; and

rotatably articulating the lightly loaded wheel assembly with respect to a chassis of the vehicle in a plane defined by the pitch of the wheeled vehicle.

11. A method, according to claim 10, wherein acquiring the load data comprises sensing a load on each suspension arm of the plurality of wheel assemblies.

12. A method, according to claim 10, wherein acquiring the load data comprises sensing a pressure of each tire of the plurality of wheel assemblies.

13. A method, according to claim 10, wherein articulating the lightly loaded wheel assembly comprises articulating the lightly loaded wheel assembly to substantially equalize the load on each of the plurality of wheel assemblies.

14. A method of controlling traction in a wheeled vehicle having rotatably articulating suspension, comprising:

determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal;

determining whether a rotational velocity of each wheel of the plurality of wheel assemblies corresponds to a velocity of the wheeled vehicle; and

rotatably articulating the suspension in a plane defined by the pitch of the wheeled vehicle such that each of the forces is within a predetermined range if the forces are not substantially equal and at least one of the rotational velocities fails to correspond to the velocity of the wheeled vehicle.

15. A method, according to claim 14, wherein determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal comprises sensing a load on each suspension arm of the plurality of wheel assemblies.

16. A method, according to claim 14, wherein determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal comprises sensing a pressure of each tire of the plurality of wheel assemblies.

17. A method, according to claim 14, wherein rotatably articulating the articulated suspension comprises adjusting the articulated suspension to substantially equalize the forces.

18. A method, according to claim 14, wherein rotatably articulating the articulated suspension comprises articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle.

19. A method, according to claim 14, further comprising determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that adjusting the articulated suspension comprises articulating the lightly loaded wheel assembly with respect to a chassis of the vehicle.

20. A method, according to claim 14, further comprising reducing the rotational velocity of one of the tires if the forces are substantially equal and the one of the tires has a determined rotational velocity that is greater than that which corresponds to the velocity of the vehicle.

21. A method, according to claim 20, wherein reducing the rotational velocity comprises reducing the rotational velocity of the tire by braking.

22. A method, according to claim 20, wherein reducing the rotational velocity comprises reducing the rotational velocity of the tire by at least partially removing power to the tire.

23. A method, according to claim 20, wherein reducing the rotational velocity comprises reducing the rotational velocity of the tire by regenerative braking.

24 – 43. (Cancelled)

44. A wheeled vehicle, comprising:

a chassis;

a suspension rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies;

means for determining a performance characteristic of the wheeled vehicle;

means for determining a performance characteristic of at least one of the wheel assemblies;

means for comparing the performance characteristic of the wheeled vehicle and the performance characteristic of the at least one of the plurality of wheel assemblies; and

means for altering the performance of the vehicle based upon the comparison to affect the wheeled vehicle's traction.

45. A vehicle, according to claim 44, wherein:

the determining means for the performance characteristic of the vehicle comprises means for determining a velocity of the vehicle; and

the determining means for the performance characteristic of the wheel assembly comprises means for determining a rotational velocity of the at least one of the plurality of wheel assemblies.

46. A vehicle, according to claim 44, wherein:

the determining means for the performance characteristic of the vehicle comprises means for determining a load on a first of a plurality of wheel assemblies; and

the determining the performance characteristic of the wheel assembly comprises means for determining a load on another one or more of the plurality of wheel assemblies.

47. A wheeled vehicle, comprising:

a chassis;

a suspension rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies;

means for determining a load on each of the wheel assemblies; and

means for adjusting the suspension through rotation such that each of the loads is within a predetermined range.

48. A vehicle, according to claim 47, wherein the load determining means comprises means for sensing a load on each suspension arm of the plurality of wheel assemblies.

49. A vehicle, according to claim 47, wherein the load determining means comprises means for sensing a pressure of each tire of the plurality of wheel assemblies.

50. A vehicle, according to claim 47, wherein the adjusting means comprises means for adjusting the articulated suspension to substantially equalize the loads.

51. A vehicle, according to claim 47, wherein the adjusting means comprises means for articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle.

52. A vehicle, according to claim 47, further comprising means for determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that the adjusting means articulates the lightly loaded wheel assembly with respect to a chassis of the vehicle.

53. A wheeled vehicle, comprising:

a chassis;

a suspension rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies;

means for acquiring load data for the wheel assemblies;

means for identifying a lightly loaded wheel assembly of the plurality of wheel assemblies from the load data; and

means for rotatably articulating the lightly loaded wheel assembly with respect to the chassis.

54. A vehicle, according to claim 53, wherein each wheel assembly includes a suspension arm and the load data acquiring means comprises means for sensing a load on each suspension arm of the plurality of wheel assemblies.

55. A vehicle, according to claim 53, wherein the load data acquiring means comprises means for sensing a pressure of each tire of the plurality of wheel assemblies.

56. A vehicle, according to claim 53, wherein the articulating means comprises means for articulating the lightly loaded wheel assembly to substantially equalize the load on each of the plurality of wheel assemblies.

57. A wheeled vehicle, comprising:

a chassis;

a suspension rotatably articulating relative to the chassis in a plane defined by the pitch of the wheeled vehicle and including a plurality of wheel assemblies, each wheel assembly including a wheel;

means for determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal;

means for determining whether a rotational velocity of each wheel corresponds to a velocity of the wheeled vehicle; and

means for rotatably articulating the articulated suspension such that each of the forces is within a predetermined range if the forces are not substantially equal and at least one of the rotational velocities fails to correspond to the velocity of the wheeled vehicle.

58. A vehicle, according to claim 57, wherein the means for determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal comprises means for sensing a load on each suspension arm of the plurality of wheel assemblies.

59. A vehicle, according to claim 57, wherein the means determining whether forces on each of a plurality of wheel assemblies of the articulated suspension are substantially equal comprises means for sensing a pressure of each tire of the plurality of wheel assemblies.

60. A vehicle, according to claim 57, wherein the rotatably articulating means comprises means for adjusting the articulated suspension to substantially equalize the forces.

61. A vehicle, according to claim 57, wherein the rotatably articulating means comprises means for articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle.

62. A vehicle, according to claim 57, further comprising means for determining a lightly loaded wheel assembly of the plurality of wheel assemblies, such that adjusting the articulated suspension comprises articulating the lightly loaded wheel assembly with respect to a chassis of the vehicle.

63. A vehicle, according to claim 57, further comprising means for reducing the rotational velocity of one of the tires if the forces are substantially equal and the one of the tires has a determined rotational velocity that is greater than that which corresponds to the velocity of the vehicle.